

# **Appendix R. Groundwater Monitoring Plan**



# **Groundwater Monitoring Work Plan**



**June 2010**



## Table of Contents

Section	Page
<b>1.0 Introduction .....</b>	<b>1-1</b>
1.1 Groundwater Resources Identified for Monitoring.....	1-1
1.2 Owner Contact and Surveys .....	1-1
<b>2.0 Sampling Strategy .....</b>	<b>2-1</b>
2.1 Methods of Sampling and Analysis .....	2-1
2.1.1 Groundwater Wells.....	2-1
2.1.1.1 Small-Diameter Groundwater Wells .....	2-3
2.1.1.2 Large Diameter Groundwater Wells .....	2-3
2.1.2 Springs .....	2-4
2.2 Sample Analysis.....	2-5
2.2.1 Field Analysis .....	2-5
2.2.2 Laboratory Analysis .....	2-5
2.3 Sampling Schedule .....	2-7
<b>3.0 Investigation-Derived Waste.....</b>	<b>3-1</b>
<b>4.0 Quality Assurance Procedures.....</b>	<b>4-1</b>
4.1 Quality Assurance/Quality Control Samples.....	4-1
4.2 Sample Analytical and Handling Procedures .....	4-4
4.2.1 Sample Identification and Documentation .....	4-4
4.2.1.1 Sample Identification .....	4-4
4.2.1.2 Sample Labels .....	4-5
4.2.1.3 Custody Seals.....	4-5
4.2.1.4 Chain-of-Custody Records .....	4-5
4.2.1.5 Field Logbooks and Data Forms.....	4-6
4.2.1.6 Photographs .....	4-6
4.2.2 Custody Procedures .....	4-7
4.2.2.1 Field Custody Procedures .....	4-7
4.2.2.2 Laboratory Custody Procedures .....	4-8
4.2.3 Sample Handling, Packaging, and Shipping.....	4-8
4.2.3.1 Sample Packaging.....	4-8
4.2.3.2 Shipping Containers .....	4-9
4.2.3.3 Marking and Labeling .....	4-9
4.3 Calibration Procedures and Frequency.....	4-9
<b>A. Groundwater Sampling Data Sheet.....</b>	<b>A-1</b>

## List of Tables

<b>Table</b>	<b>Page</b>
Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring .....	1-3
Table 2-1 Field Sampling Decision Matrix .....	2-2
Table 2-2 Sample Analysis Summary .....	2-6
Table 4-1 QA/QC Analytical Summary and Fixed Laboratory Methods .....	4-2
Table 4-2 Sample Coding .....	4-5

## List of Abbreviations and Acronyms

E & E	Ecology and Environment, Inc.
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
Project	Ruby Pipeline Project
QA	Quality Assurance
QC	Quality Control
ROW	right-of-way
Ruby	Ruby Pipeline, LLC
SOP	Standard Operating Procedures
USGS	U.S. Geologic Survey





# 1.0 Introduction

Ecology and Environment, Inc. (E&E) under contract to Ruby Pipeline, LLC (Ruby), has prepared this Groundwater Monitoring Work Plan to monitor groundwater quality and yield for public and private supply wells and springs within 200 feet of the pipeline right-of-way (ROW) for the Ruby Pipeline Project (Project). As required by the Federal Energy Regulatory Commission (FERC), and with the owner's permission, groundwater monitoring would be conducted before and after construction to determine whether water supplies have been affected by pipeline construction activities. This work plan describes groundwater resources identified for monitoring; access and information needs from property owners; sampling methodologies and testing procedures; laboratory analytical methods; management of investigation-derived waste; and quality assurance procedures.

## 1.1 Groundwater Resources Identified for Monitoring

Table 1-1 summarizes available ownership information and the potential groundwater wells and springs for monitoring. Final identification and confirmation of groundwater resources within 200 feet of the ROW will be conducted through surveys of these local landowners prior to construction. It is estimated that approximately 100 wells and springs will require monitoring.

## 1.2 Owner Contact and Surveys

Groundwater supply wells and potable springs within 200 feet of the edge of proposed construction ROW and staging areas are considered potentially susceptible to impacts from proposed construction activities. Landowners identified as having potentially susceptible groundwater resources will be supplied with documentation explaining the field investigation, the proposed pipeline construction, and potential impacts on groundwater resources. The documentation will also indicate how the landowner can contact Ruby for further information. A Groundwater Resources Survey form will be mailed or hand delivered by Ruby to each landowner identified in Table 1-1. The survey form will be used to confirm ownership of identified water wells and/or springs; identify any additional wells or springs on the property; and obtain information regarding location and access for sampling and testing. In addition, landowners shall be requested to identify the use of the well or spring (residential, municipal, self-supplied, irrigation, industrial, or livestock).

Owners of wells and potable springs potentially susceptible to impacts will be advised that pre-construction monitoring is recommended to establish a pre-construction water quality baseline. Such owners will be advised that the testing is designed to assess the impacts of construction on their water supplies and not to determine potability. They will be further advised to contact their local health departments for more information regarding the

potability of their water supplies or if the water is fit for intended purposes. Owners will be requested to allow testing of their well and/or spring for production and water quality.

During construction, Ruby notes that owners of wells and/or springs located outside the 200-foot monitoring area may request water sampling. In these cases, sampling would follow the same schedule and utilize the same methods described for water wells and potable springs located within the 200-foot monitoring area. The Summit Lake Paiute Tribe has requested that One Mile Spring, located 4,000 feet south of the project area, be monitored for potential impacts to groundwater before, during, and after construction.

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
BLM	312 Highway 189 North, Kemmerer, WY 83101-9711	- 110.3480	41.7763	Lincoln	Wyomin g	0.1	021	N	114	W	028	NE	NENE	BLM	2114-01-1-00-500.00	Well	1
Rose Thornock	#18 Grass Valley, Evanston, WY 82930	- 110.9562	41.8122	Lincoln	Wyomin g		021	N	119	W	008	SW	NESW	Rose Thornock	2119-083-0100100	Well	9003
John Dyer c/o Rose Thornock	PO Box 4, St. Charles, ID 83272	- 110.9562	41.8122	Lincoln	Wyomin g		021	N	119	W	008	SW	NESW	John Dyer c/o Rose Thornock	2119-083-0400700	Well	9005
BLM	5353 Yellowstone Rd, Cheyenne, WY 82009	- 110.5542	41.5863	Lincoln	Wyomin g		019	N	116	W	032	SW	NESW	BLM	1916-321-00-500	Spring	9001
John Julian c/o Ethel Julian	PO Box 388, Evanston, WY 82931	- 110.9562	41.8122	Lincoln	Wyomin g		021	N	119	W	008	SW	NESW	John Julian c/o Ethel Julian	2119-083-0200300	Well	9004
Perkins Family Trust	PO Box 83, Pocatello, ID 83024	- 110.9562	41.8122	Lincoln	Wyomin g		021	N	119	W	008	SW	NESW	Perkins Family Trust	2119-083-0001200	Well	9002
Uinta Livestock Grazing Partnership	PO Box 58395, Salt Lake City, UT 84158	- 110.7772	41.5231	Uinta	Wyomin g	33.2	018	N	118	W	020	SE	SWSE	Uinta Livestock Grazing Partnership	16571	Well	2
		- 110.9167	41.5306	Uinta	Wyomin g	41.1	018	N	119	W	019	NW	SENW	Uinta Livestock Grazing Partnership	16573	Well	3
BLM	2370 South 2300 West, Salt Lake City, UT 84119	- 111.0022	41.3383	Uinta	Wyomin g	42.2	018	N	120	W	024	NW	SENW	BLM	N/A	Well	4
		- 111.0022	41.3419	Uinta	Wyomin g	42.2	018	N	120	W	024	NW	SENW	BLM	N/A	Well	5
		- 111.0022	41.3419	Uinta	Wyomin g	42.2	018	N	120	W	024	NW	SENW	BLM	N/A	Well	6
		- 111.0719	41.5316	Rich	Utah	49.4	009	N	008	E	006	SE	SESE	20-06-00-001		Underground	7
		- 111.0841	41.5397	Rich	Utah	50.1	009	N	008	E	006	SW	SESW	20-06-00-001		Underground	8
V. Stuart & Carol G. Hopkin & John T. Hopkin	900 South Hopkin Lane, Woodruff, UT 84086	- 111.0899	41.5280	Rich	Utah	50.6	009	N	007	E	012	NE	NENE	19-12-00-005		Underground	9
		- 111.0902	41.5282	Rich	Utah	50.6	009	N	007	E	012	NE	NENE	19-12-00-005		Underground	10

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
Rees Land & Livestock Company	8 Miles South of Town, Woodruff, UT 84086	- 111.1278	41.5270	Rich	Utah	52.6	009	N	007	E	011	SW	SWSW	19-11-00-001		Point to Point	11
Wesley Tingey & Dorothy A. Tingey	520 East Little Crawford Rd, Woodruff, UT 84086	- 111.1326	41.5270	Rich	Utah	52.8	009	N	007	E	010	SE	SESE	19-10-00-001		Point to Point	12
		- 111.1326	41.5270	Rich	Utah	52.8	009	N	007	E	010	SE	SESE	19-10-00-001		Point to Point	13
		- 111.1326	41.5270	Rich	Utah	52.8	009	N	007	E	010	SE	SESE	19-10-00-001		Point to Point	14
		- 111.1326	41.5270	Rich	Utah	52.8	009	N	007	E	010	SE	SESE	19-10-00-001		Point to Point	15
Rafter J Ranch, LLC	100 N 60 E, Woodruff, UT 84086	- 111.1485	41.5163	Rich	Utah	53.9	009	N	007	E	015	SW	NWSW	19-15-00-004		Surface	16
Wallace Schulthess & Connie Schulthess	385 Schulthess Lane, Woodruff, UT 84086	- 111.1499	41.5172	Rich	Utah	54.0	009	N	007	E	016	SE	NESE	19-16-61-012		Surface	17
		- 111.1513	41.5164	Rich	Utah	54.1	009	N	007	E	016	SE	NESE	19-16-52-023		Surface	18
Rafter J Ranch, LLC	100 N 60 E, Woodruff, UT 84086	- 111.1601	41.5133	Rich	Utah	54.6	009	N	007	E	016	SW	SESW	19-16-34-001		Point to Point	19
		- 111.1601	41.5133	Rich	Utah	54.6	009	N	007	E	016	SW	SESW	19-16-34-001		Point to Point	20
		- 111.1619	41.5149	Rich	Utah	54.6	009	N	007	E	016	SW	SESW	19-16-34-001		Underground	21
		- 111.1619	41.5149	Rich	Utah	54.6	009	N	007	E	016	SW	SESW	19-16-34-001		Underground	22
		- 111.1626	41.5145	Rich	Utah	54.6	009	N	007	E	016	SW	SESW	19-16-34-001		Point to Point	23
Stacy Ranch, LLC	PO Box 31, Woodruff, UT 84086	- 111.1706	41.5110	Rich	Utah	55.2	009	N	007	E	020	NE	NENE	19-20-00-002		Well	24
		- 111.1725	41.5094	Rich	Utah	55.3	009	N	007	E	020	NE	NENE	19-20-00-002		Well	25
K-M Cornia Investments Company, Ltd	555 E REX LN P.O. BOX #172 , Randolph, UT 84064	- 111.2074	41.4953	Rich	Utah	57.4	009	N	007	E	030	NW	L 1	19-30-00-001		Well	26
Orson Cornia & Louisa Cornia, Trustees	340 E. St Rd. 15, Woodruff, UT 84086	- 111.2683	41.4816	Rich	Utah	60.9	009	N	006	E	028	SE	SESE	18-28-00-002		Point to Point	27
		- 111.2683	41.4816	Rich	Utah	60.9	009	N	006	E	028	SE	SESE	18-28-00-002		Point to Point	28
		- 111.2770	41.4779	Rich	Utah	61.4	009	N	006	E	033	NW	NENW	18-33-00-001		Rediversion	29
		- 111.2770	41.4779	Rich	Utah	61.4	009	N	006	E	033	NW	NENW	18-33-00-001		Rediversion	30
		- 111.2770	41.4779	Rich	Utah	61.4	009	N	006	E	033	NW	NENW	18-33-00-001		Rediversion	31

RUBY PIPELINE PROJECT

GROUNDWATER MONITORING PLAN

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
		- 111.2770	41.4779	Rich	Utah	61.4	009	N	006	E	033	NW	NENW	18-33-00-001		Surface	32
		- 111.2770	41.4779	Rich	Utah	61.4	009	N	006	E	033	NW	NENW	18-33-00-001		Surface	33
		- 111.2776	41.4780	Rich	Utah	61.5	009	N	006	E	033	NW	NENW	18-33-00-001		Point to Point	34
		- 111.2776	41.4780	Rich	Utah	61.5	009	N	006	E	033	NW	NENW	18-33-00-001		Point to Point	35
Arlo H. Eastman Family, LLC	1915 W Monte Cristo Rd., Woodruff, UT 84086	- 111.3791	41.4719	Rich	Utah	67.1	009	N	005	E	033	SW	NESW	18-33-00-002		Point to Point	36
		- 111.3791	41.4719	Rich	Utah	67.1	009	N	005	E	033	SW	NESW	18-33-00-002		Point to Point	37
North Davis Cabinet, Inc.	1651 S 300 W, Clearfield, UT 840150000	- 111.4553	41.4678	Rich	Utah	71.3	009	N	004	E	035	SW	SESW	16-35-00-006		Point to Point	38
Edgar F. Prasthofer	20351 Rockwood Trail, Morrison, CO 80465-2409	- 111.5444	41.4641	Cache	Utah	76.2	008	N	003	E	001	NE	L 1	16-109-0034		Underground	39
		- 111.5511	41.4641	Cache	Utah	76.6	008	N	003	E	001	NE	L 2	16-109-0033		Underground	40
Ira Dawn Harmer Trust	4337 Bobwhite Ct., Ogden, UT 84403-3262	- 111.5511	41.4641	Cache	Utah	76.6	008	N	003	E	001	NE	L 2	16-109-0033		Abandoned Well	41
		- 111.5511	41.4641	Cache	Utah	76.6	008	N	003	E	001	NE	L 2	16-109-0033		Abandoned Well	42
		- 111.5511	41.4641	Cache	Utah	76.6	008	N	003	E	001	NE	L 2	16-109-0033		Abandoned Well	43
		- 111.5511	41.4641	Cache	Utah	76.6	008	N	003	E	001	NE	L 2	16-109-0033		Underground	44
Coldwater Ranch, Inc.	777 E 2100 S, Salt Lake City, UT 84106-1829	- 111.6081	41.4933	Cache	Utah	80.7	009	N	003	E	028	NE	NWNE	16-097-0008		Surface	45
		- 111.6103	41.4969	Cache	Utah	81.1	009	N	003	E	021	SW	SESW	16-092-0007		Point to Point	46
The Hideout 1000, LLC	PO Box 1169, Eden, UT 84310-1169	- 111.6391	41.5257	Cache	Utah	83.7	009	N	003	E	007	SE	SESE	16-088-0004		Point to Point	47
Gary W. Stuart	2784 N 1000 E, Ogden, UT 84414-2428	- 111.6772	41.5360	Cache	Utah	86.0	009	N	002	E	012	NW	NWNW	16-075-0045		Point to Point	48
Stephen L. Critchlow	3705 N 800 W, Ogden, UT 84414-1430	- 111.6820	41.5360	Cache	Utah	86.2	009	N	002	E	011	NE	NENE	16-075-0085		Point to Point	49
Ellis Family	2709 East	- 111.6820	41.5359	Cache	Utah	86.5	009	N	002	E	011	NE	NWNE	16-075-		Point to	50

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
Trust	Sky View Drive, Layton, UT 84040-2746	111.6865												0075		Point	
		- 111.6865	41.5359	Cache	Utah	86.5	009	N	002	E	011	NE	NWNE	16-075-0075		Point to Point	51
Monte T. & Janae F. Matue	5055 W 2150 N, Ogden, UT 84404-9041	- 111.6963	41.5398	Cache	Utah	87.2	009	N	002	E	002	SW	SWSW	16-075-0080		Surface	52
Summers Ranch, LLC	PO Box 290, Paradise, UT 84328-0290	- 111.8332	41.6193	Cache	Utah	90.1	009	N	002	E	005	SW	SESW	16-077-0001		Underground	53
		- 111.8332	41.6193	Cache	Utah	90.1	009	N	002	E	005	SW	SESW	16-077-0001		Underground	54
		- 111.8326	41.6198	Cache	Utah	90.1	009	N	002	E	005	SW	SESW	16-077-0001		Underground	55
		- 111.8325	41.6207	Cache	Utah	90.1	009	N	002	E	005	SW	SESW	16-077-0001		Underground	56
CE Land Holdings, LLC	11240 S 1200 E, Avon, UT 84328-9713	- 111.7529	41.5192	Cache	Utah	91.7	009	N	002	E	018	NE	NWNE	16-081-0001		Point to Point	57
		- 111.7529	41.5192	Cache	Utah	91.7	009	N	002	E	018	NE	NWNE	16-081-0001		Point to Point	58
		- 111.7529	41.5192	Cache	Utah	91.7	009	N	002	E	018	NE	NWNE	16-081-0001		Point to Point	59
		- 111.7529	41.5192	Cache	Utah	91.7	009	N	002	E	018	NE	NWNE	16-081-0001		Point to Point	60
		- 111.7624	41.5227	Cache	Utah	91.7	009	N	002	E	018	NE	NWNE	16-081-0001		Point to Point	61
State of Utah Department of Natural Resources- Division of Wildlife Resources	PO Box 14630, Salt Lake City, UT 84114	- 111.7682	41.5189	Cache	Utah	92.2	009	N	002	E	018	NW	SENW	17-081-0002		Point to Point	62
		- 111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	63
		- 111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	64
		- 111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	65
		- 111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	66
		- 111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	67
		- 111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	68
		- 111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	69
		- 111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	70
		- 111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	71
		- 111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	72
		-	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-		Surface	73

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
		111.7731												0002			
		-												17-081-0002			
		111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	74
		-												17-081-0002			
		111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	75
		-												17-081-0002			
		111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	76
		-												17-081-0002			
		111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	77
		-												17-081-0002			
		111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	78
		-												17-081-0002			
		111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	79
		-												17-081-0002			
		111.7731	41.5204	Cache	Utah	92.5	009	N	002	E	018	NW	L 2	17-081-0002		Surface	80
		-												17-081-0002			
		111.7690	41.5201	Cache	Utah		009	N	002	E	018	NW	SENW	17-081-0002		Seep/Spring	9021
CE Land Holdings, LLC	11240 S 1200 E, Avon, UT 84328-9713	-												16-049-0001			
		111.7769	41.5211	Cache	Utah	92.7	009	N	001	E	013	NE	NENE	16-049-0001		Underground	81
		-												16-049-0001			
		111.7795	41.5223	Cache	Utah	92.8	009	N	001	E	013	NE	NENE	16-049-0001		Surface	82
Patricia & Wayne Gibbs	2451 W 2000 S, Lewiston, UT 84320-2314	-												16-049-0004			
		111.7823	41.5191	Cache	Utah	93.1	009	N	001	E	013	NE	SWNE	16-049-0004		Point to Point	84
Roger & Collette Pulsipher	11800 S 800 E, Paradise, UT 84328-9734	-												16-052-0015			
		111.8129	41.5214	Cache	Utah	94.7	009	N	001	E	014	SW	NWSW	16-052-0015		Underground	85
		-												16-052-0015			
		111.8123	41.5187	Cache	Utah	94.8	009	N	001	E	014	SW	NWSW	16-052-0015		Underground	86
Guy Ray Pulsipher, etal	11271 S 800 E, Paradise, UT 84328-9733	-												16-052-0015			
		111.8123	41.5187	Cache	Utah	94.8	009	N	001	E	014	SW	NWSW	16-052-0015		Underground	87
		-												16-053-0009			
		111.8174	41.5207	Cache	Utah	94.9	009	N	001	E	015	SE	NESE	16-053-0009		Well	104
		-												16-053-0009		Point to Point	105
Roger & Collette Pulsipher	11800 S 800 E, Paradise, UT 84328-9734	-												16-053-0009			
		111.8183	41.5211	Cache	Utah	94.9	009	N	001	E	015	SE	NESE	16-053-0009		Point to Point	106
		-												16-053-0009			
		111.8161	41.5229	Cache	Utah	94.9	009	N	001	E	015	SE	NESE	16-053-0009		Point to Point	107
Roger & Collette Pulsipher	11800 S 800 E, Paradise, UT 84328-9734	-												16-053-0009			
		111.8161	41.5229	Cache	Utah	94.9	009	N	001	E	015	SE	NESE	16-053-0009		Point to Point	107
		-												16-052-0015		Point to Point	88
		111.8127	41.5144	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Point to Point	88
Roger & Collette Pulsipher	11800 S 800 E, Paradise, UT 84328-9734	-												16-052-0015			
		111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	89
		-												16-052-0015			
		111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	90
Roger & Collette Pulsipher	11800 S 800 E, Paradise, UT 84328-9734	-												16-052-0015			
		111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	91
		-												16-052-0015			
		111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	91

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	92
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	93
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	94
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	95
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	96
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	97
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	98
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	99
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	100
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	101
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	102
		- 111.8129	41.5153	Cache	Utah	94.9	009	N	001	E	014	SW	NWSW	16-052-0015		Surface	103
Summers Ranch, LLC	PO Box 290, Paradise, UT 84328-0290	- 111.8398	41.5121	Cache	Utah	96.5	009	N	001	E	016	SE	SWSE	16-054-0001		Point to Point	108
Clay Alley LLC	1535 East Canyon Road, Avon, UT 84328	- 111.7939	41.5268	Cache	Utah		009	N	001	E	011	SE	SESE	16-047-0029		Underground Water Well	9007
Curtis S. & Allison C. Olsen	1445 East 11200 South, Avon, UT 84328	- 111.7939	41.5268	Cache	Utah		009	N	001	E	011	SE	SESE	16-047-0023		Underground Water Well	9008
Darrin J. & Angela Cushman	1635 East Canyon Road, Avon, UT 84328	- 111.7935	41.5259	Cache	Utah		009	N	001	E	012	SW	SWSW	16-048-0006		Underground Water Well	9010
Rod J. & Lori Cushman	1795 East Canyon Road, Avon, UT 84328	- 111.7935	41.5259	Cache	Utah		009	N	001	E	012	SW	SWSW	16-048-0004		Underground Water Well	9011
Deanna Searle	1615 East 11200 South, Avon, UT 84328	- 111.7939	41.5268	Cache	Utah		009	N	001	E	011	SE	SESE	16-047-0024		Underground Water Well	9006
		- 111.7935	41.5259	Cache	Utah		009	N	001	E	012	SW	SWSW	16-047-0024		Underground Water Well	9012
James M. Robinson	PO Box 795, Middleton,	- 111.7939	41.5268	Cache	Utah		009	N	001	E	011	SE	SESE	16-047-0033		Underground Water Well	9009



Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
	MA 01949																
Don & June Baxter	876 Rosewood Lane, Layton, UT 84041-4334	- 111.9437	41.5263	Box Elder	Utah	102.6	009	N	001	W	010	SW	SESW	03-025-0008		Surface	109
Beecher Brothers Investment Company Inc.	679 South Ridge Road, Cedar City, UT 84720-2900	- 111.9843	41.5172	Box Elder	Utah	104.9	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	110
		- 111.9843	41.5172	Box Elder	Utah	104.9	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	111
		- 111.9845	41.5169	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	112
		- 111.9845	41.5169	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	113
		- 111.9846	41.5167	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Rediversion	114
		- 111.9848	41.5168	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	115
		- 111.9848	41.5168	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	116
		- 111.9845	41.5160	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	117
		- 111.9845	41.5160	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	118
		- 111.9845	41.5160	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	119
		- 111.9847	41.5161	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	120
		- 111.9847	41.5161	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	121
		- 111.9847	41.5161	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	122
		- 111.9850	41.5166	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	123
		- 111.9850	41.5166	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Surface	124
		- 111.9854	41.5162	Box Elder	Utah	105.1	009	N	001	W	017	SW	NWSW	03-002-0050		Rediversion	125
		- 111.9854	41.5156	Box Elder	Utah	105.3	009	N	001	W	017	SW	NWSW	03-002-0050		Rediversion	126
		- 111.9932	41.5153	Box Elder	Utah	105.9	009	N	001	W	018	SE	NESE	03-032-0030		Surface	127
		- 111.9855	41.5167	Box Elder	Utah		009	N	001	W	017	SW	NWSW	03-002-0050		Seep/Spring	9019
		- 111.9853	41.5169	Box Elder	Utah		009	N	001	W	017	SW	NWSW	03-002-0050		Spring	9020

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
Don K. & Brenda J. Cool	318 Highland Boulevard, Brigham City, UT 84302-2329	- 111.9957	41.5184	Box Elder	Utah	106.0	009	N	001	W	018	NE	SWNE	03-032-0004		Surface	128
Thomas G. & Joanne A. Coppin	4313 Summerview Cir, Bountiful, UT 84010-5851	- 111.9972	41.5217	Box Elder	Utah	106.3	009	N	001	W	018	NE	NWNE	03-032-0002		Surface	129
		- 111.9980	41.5229	Box Elder	Utah	106.4	009	N	001	W	018	NE	NWNE	03-032-0002		Well(s)	130
		- 111.9991	41.5240	Box Elder	Utah	106.5	009	N	001	W	018	NW	L 5	03-032-0002		Surface	131
Blaine & Susan Richins	1550 N 170 E, Brigham City, UT 84302-3759	- 112.0079	41.5370	Box Elder	Utah	107.5	009	N	002	W	012	NE	NENE	03-080-0001		Underground	132
		- 112.0080	41.5369	Box Elder	Utah	107.5	009	N	002	W	012	NE	NENE	03-080-0001		Underground	133
		- 112.0081	41.5372	Box Elder	Utah	107.5	009	N	002	W	012	NE	NENE	03-080-0001		Underground	134
David & Rita Tea	1654 North Highway 38, Brigham City, UT 84302-3709	- 112.0088	41.5395	Box Elder	Utah	107.7	009	N	002	W	001	SE	SESE	03-066-0034		Underground	135
		- 112.0089	41.5412	Box Elder	Utah	107.8	009	N	002	W	001	SE	SESE	03-066-0034		Surface	136
		- 112.0089	41.5412	Box Elder	Utah	107.8	009	N	002	W	001	SE	SESE	03-066-0034		Surface	137
		- 112.0088	41.5414	Box Elder	Utah		009	N	002	W	001	SE	SESE	03-066-0034		Spring	9022
Ronald & Sharon Smith	320 W 600 N, Brigham City, UT 84302-1430	- 112.0242	41.5543	Box Elder	Utah	109.2	010	N	002	W	036	SW	SWSW	04-048-0015		Underground	138
State of Utah Division of Forestry, Fire & State Lands	1594 West North Temple, Salt Lake City, UT 84114-5703	- 112.0334	41.5632	Box Elder	Utah	110.0	010	N	002	W	(blank)	(blank)	(blank)	04-047-0009		Surface	139
		- 112.0334	41.5632	Box Elder	Utah	110.0	010	N	002	W	(blank)	(blank)	(blank)	04-047-0009		Surface	140
Kim G. Fuller	PO Box 2040, Evanston, WY 82931-2040	- 112.0340	41.5708	Box Elder	Utah	110.5	010	N	002	W	026	SE	SWSE	04-037-0016		Surface	141
Bar D D LC	5975 N 7600 W, Tremonton, UT 84337-8634	- 112.2119	41.6111	Box Elder	Utah	120.9	010	N	003	W	008	SW	SWSW	04-055-0003		Underground	142
Box Elder County	1 S Main, Brigham City, UT 84302	- 112.2415	41.6268	Box Elder	Utah	122.8	010	N	004	W	001	SE	SWSE	04-091-0003		Underground	143

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
Eph C Jensen Land LLC	7015 N 6800 W, Tremonton, UT 84337	- 112.2836	41.6366	Box Elder	Utah	125.1	010	N	004	W	003	NE	L 2	04-004-0007		Surface	144
Kathleen Tenderholt Family Protection Trust	102 East Phillips, Layton, UT 84041-4111	- 112.2914	41.6369	Box Elder	Utah	125.5	011	N	004	W	034	SW	SWSW	05-128-0007		Point to Point	145
Connor Cattle Company	13675 West Highway 102, Tremonton, UT 84337-9112	- 112.3146	41.6371	Box Elder	Utah	126.7	010	N	004	W	005	NE	L 1	04-004-0079		Underground	146
Bar-M Land & Livestock LLC	910 West 21st St, Ogden, UT 84401-5600	- 112.3528	41.6779	Box Elder	Utah	130.6	011	N	004	W	019	NW	L 1	05-003-0020		Underground	147
Frank Rees Farms Limited	1790 North Highway 38, Brigham City, UT 84302-3711	- 112.5342	41.7346	Box Elder	Utah	142.1	012	N	006	W	033	NE	NENE	06-005-0047		Underground	148
Bar H Ranch Inc	PO Box 273, Bear River City, UT 84301-0273	- 112.6609	41.7522	Box Elder	Utah	149.0	012	N	007	W	021	NE	NWNE	06-006-0030		Surface	149
		- 112.6606	41.7531	Box Elder	Utah	149.0	012	N	007	W	021	NE	NWNE	06-006-0030		Surface	150
		- 112.6618	41.7533	Box Elder	Utah	149.0	012	N	007	W	021	NW	NENW	06-006-0030		Surface	151
State of Utah School & Institutional Trust Lands Admin	675 E 500 S Ste 500, Salt Lake City, UT 84102-2818	- 112.9847	41.7625	Box Elder	Utah	166.1	012	N	010	W	016	SE	SWSE	06-009-0020		Point to Point	152
		- 113.1108	41.7614	Box Elder	Utah	172.6	012	N	011	W	016	SW	SWSW	06-010-0029		Underground	153
US BLM - Utah State Office	PO Box 45155, Salt Lake City, UT 84145-0155	- 113.2868	41.6561	Box Elder	Utah	184.8	011	N	013	W	025	NW	NWNW	05-012-0025		Underground	154
		- 113.2907	41.6537	Box Elder	Utah	185.1	011	N	013	W	026	NE	NENE	05-012-0048		Underground	155
		- 113.6066	41.5962	Box Elder	Utah	201.9	010	N	015	W	016	SW	L 5	04-013-0024		Surface	156
		- 113.6066	41.5962	Box Elder	Utah	201.9	010	N	015	W	016	SW	L 5	04-013-0024		Surface	157
		0.0000	0.0000	Box Elder	Utah	201.9	010	N	015	W	016	SW	L 6	04-013-0024			158
		0.0000	0.0000	Box Elder	Utah	201.9	010	N	015	W	016	SW	NESW	04-013-0024			159
		0.0000	0.0000	Box Elder	Utah	201.9	010	N	015	W	016	SW	L 6	04-013-0024			160
		0.0000	0.0000	Box	Utah	201.9	010	N	015	W	016	SW	NESW	04-013-			161

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
				Elder										0024			
Boyd A & Roma S Warr	HC 63 Box 4, Grouce Creek, UT 84313-9701	- 113.9364	41.4393	Box Elder	Utah	225.0	008	N	018	W	005	SW	SESW	02-020-0005		Underground	162
		- 113.9066	41.5080	Box Elder	Utah	225.0	008	N	018	W	005	SW	SESW	02-020-0005		Underground	163
		- 113.9064	41.5080	Box Elder	Utah	225.0	008	N	018	W	005	SW	SESW	02-020-0005		Underground	164
		- 113.9064	41.5080	Box Elder	Utah	225.0	008	N	018	W	005	SW	SESW	02-020-0005		Underground	165
		- 113.9055	41.5080	Box Elder	Utah	225.0	008	N	018	W	005	SW	SESW	02-020-0005		Underground	166
		- 113.9073	41.5076	Box Elder	Utah	225.1	008	N	018	W	005	SW	SESW	02-020-0005		Underground	167
		- 113.9073	41.5076	Box Elder	Utah	225.1	008	N	018	W	005	SW	SESW	02-020-0005		Underground	168
Boyd S. Marble	11150 West 11200 North, Tremonton, UT 84337	- 112.2848	41.7095	Box Elder	Utah		011	N	004	W	003	SE	SWSE	05-099-0010		Underground Water Well	9026
Collin & Rita Hansen Trust	PO Box 211, Bear River City, UT 84301	- 112.1897	41.5960	Box Elder	Utah		010	N	003	W	016	SW	SESW	04-003-0006		UGW-Drains	9024
		- 112.1963	41.5994	Box Elder	Utah		010	N	003	W	016	SW	NWSW	04-003-0006		UGW & Surface Drains	9025
Dee's Inc.	777 East 2100 South, Salt Lake City, UT 84106	- 113.1132	41.7900	Box Elder	Utah		012	N	011	W	004	SW	SWSW	06-010-0005		UGW-Wells	9027
		- 113.1132	41.7900	Box Elder	Utah		012	N	011	W	004	SW	SWSW	06-010-0005		Underground Water Well	9028
Goose Lake State Park	No Data	- 112.0008	41.5267	Box Elder	Utah		009	N	001	W	007	SW	L 5	N/A		Seep/Spring	9013
		- 112.0007	41.5269	Box Elder	Utah		009	N	001	W	007	SW	L 5	N/A		Seep/Spring	9014
		- 112.0008	41.5269	Box Elder	Utah		009	N	001	W	007	SW	L 5	N/A		Seep/Spring	9015
		- 112.0009	41.5270	Box Elder	Utah		009	N	001	W	007	SW	L 5	N/A		Seep/Spring	9016
		- 111.9993	41.5273	Box Elder	Utah		009	N	001	W	007	SW	L 5	N/A		Spring	9017
		- 112.0018	41.5286	Box Elder	Utah		009	N	001	W	007	SW	L 3	N/A		Seep/Spring	9018
Lyle D. Nessen	17485 West Blue Creek Drive, Howell, UT 84316	- 112.4547	41.8172	Box Elder	Utah		013	N	005	W	031	SE	NESE	07-100-0003		Underground Water Well	9029
		- 112.4547	41.8172	Box Elder	Utah		013	N	005	W	031	SE	NESE	07-100-0003		Underground Water Well	9030
		- 112.4547	41.8172	Box Elder	Utah		013	N	005	W	031	SE	NESE	07-100-0003		Underground Water Well	9031

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Nicoli Nicholas	1892 Hershey Dr, Woodland, CA 95776	- 112.1989	41.6011	Box Elder	Utah		010	N	002	W	017	SE	NESE	04-003-0008		Seep/Spring	9023
Walker-Winecup-Gamble, Inc	PO Box 249, Montello, NV 89830-0249	- 114.0606	41.4630	Elko	Nevada	231.8	041	N	070	E	005	SW	SESW	010-820-001		(blank)	169
US BLM - Elko District Office	3900 East Idaho Street, Elko, NV 89801-4692	- 114.3703	41.4266	Elko	Nevada	250.2	041	N	067	E	022	NW	SWNW	888510		Well	170
		- 114.3728	41.4249	Elko	Nevada	250.3	041	N	067	E	022	NW	NWNW	888510		Well	171
Tabor Creek, LLC	HC 62 Box 1600, Wells, NV 89835-9805	- 115.1539	41.3105	Elko	Nevada	293.2	040	N	060	E	036	SW	NWSW	007-580-009		Well	172
US BLM - Elko District Office	3900 East Idaho Street, Elko, NV 89801-4692	- 115.2595	41.2652	Elko	Nevada	300.5	039	N	059	E	013	SE	NWSE	888537		Well	173
		- 115.4456	41.2460	Elko	Nevada	311.1	039	N	058	E	028	NW	NENW	888549		Spring	174
		- 115.6942	41.2499	Elko	Nevada	324.9	039	N	056	E	020	SW	SESW	888565		Spring	175
Glaser Land and Livestock Co.	PO Box 325, Halleck, NV 89824-9998	- 115.7959	41.2455	Elko	Nevada	330.2	039	N	055	E	029	NE	SENE	006-140-008		Well	176
		- 115.7959	41.2455	Elko	Nevada	330.2	039	N	055	E	029	NE	SENE	006-140-008		Well	177
		- 115.7959	41.2455	Elko	Nevada	330.2	039	N	055	E	029	NE	SENE	006-140-008		Well	178
US BLM - Elko District Office	3900 East Idaho Street, Elko, NV 89801-4692	- 115.8076	40.8394	Elko	Nevada	333.7	039	N	054	E	035	NE	L 2	888576-1		Well	179
Van Norman Ranches, Inc	HC 32 Box 160, Tuscarora, NV 89834-9702	- 115.9615	41.2230	Elko	Nevada	339.1	039	N	053	E	036	SW	SESW	005-340-001		Well	180
US BLM - Elko District Office	3900 East Idaho Street, Elko, NV 89801-4692	- 116.1079	41.2074	Elko	Nevada	346.9	038	N	052	E	003	SE	SESE	N/A		Spring	181
26 Ranch, Inc	1658 Cole Boulevard, Suite 210, Lakewood, CO 80401-3304	- 116.3584	41.2105	Elko	Nevada	360.3	039	N	050	E	032	SW	NWSW	004-750-002		Well	182
Barrick Goldstrike Mines, Inc	136 East South Temple, Salt Lake City, UT	- 116.5123	41.2094	Elko	Nevada	368.4	039	N	048	E	035	SE	NESE	004-510-003		Well	183

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Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
	84111-1180																
US BLM - Winnemucca Field Office - Realty	5100 East Winnemucca Boulevard, Winnemucca , NV 89445-2921	- 117.0446	41.1377	Humboldt	Nevada	398.3	038	N	044	E	032	NW	NWNW	N/A		Stream	184
Oro Vaca, Inc	5716 South Bemis Street, Littleton, CO 80120-2009	- 117.1571	41.1105	Humboldt	Nevada	404.5	037	N	043	E	005	SW	NESW	?		Well	185
US BLM - Winnemucca Field Office - Realty	5100 East Winnemucca Boulevard, Winnemucca , NV 89445-2921	- 117.2751	41.0727	Humboldt	Nevada	410.9	037	N	042	E	020	NW	NWNW	888612		Well	186
		- 117.2751	41.0727	Humboldt	Nevada	410.9	037	N	042	E	020	NW	NWNW	888612		Well	187
		- 117.2751	41.0727	Humboldt	Nevada	410.9	037	N	042	E	020	NW	NWNW	888612		Well	188
		- 117.2751	41.0727	Humboldt	Nevada	410.9	037	N	042	E	020	NW	NWNW	888612		Well	189
		- 117.2751	41.0727	Humboldt	Nevada	410.9	037	N	042	E	020	NW	NWNW	888612		Well	190
		- 117.2751	41.0727	Humboldt	Nevada	410.9	037	N	042	E	020	NW	NWNW	888612		Well	191
		- 117.2751	41.0727	Humboldt	Nevada	410.9	037	N	042	E	020	NW	NWNW	888612		Well	192
Pacific West Financial Corporation	PO Box 60927, Reno, NV 89506-0018	- 117.3618	41.0746	Humboldt	Nevada	416.0	037	N	041	E	021	NE	NWNE	007-162-02-1		Spring	193
		- 117.3618	41.0746	Humboldt	Nevada	416.0	037	N	041	E	021	NE	NWNE	007-162-02-1		Well	194
		- 117.3618	41.0746	Humboldt	Nevada	416.0	037	N	041	E	021	NE	NWNE	007-162-02-1		Well	195
		- 117.3618	41.0746	Humboldt	Nevada	416.0	037	N	041	E	021	NE	NWNE	007-162-02-1		Spring	196
		- 117.3618	41.0746	Humboldt	Nevada	416.0	037	N	041	E	021	NE	NWNE	007-162-02-1		Spring	197
		- 117.3710	41.0746	Humboldt	Nevada	416.5	037	N	041	E	021	NW	NWNW	007-162-02-1		Well	198
Genus LP	2006 State Highway 395, Fallbrook, CA 92028-8816	- 117.5965	41.2243	Humboldt	Nevada	433.6	039	N	039	E	028	SW	SWSW	006-201-50		Well	199
US BLM - Winnemucca Field Office - Realty	5100 East Winnemucca Boulevard, Winnemucca , NV 89445-2921	- 118.2760	41.4443	Humboldt	Nevada	476.5	041	N	033	E	009	NE	SENE	888680		Well	200
		- 118.2760	41.4443	Humboldt	Nevada	476.5	041	N	033	E	009	NE	SENE	888680		Well	201

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
Pine Forest Land and Stock Company	PO Box 2087, Winnemucca , NV 89446-2087	- 118.7246	41.4888	Humboldt	Nevada	502.2	041	N	028	E	012	NW	SWNW	002-501-03		Well	202
		- 118.7296	41.4888	Humboldt	Nevada	502.4	041	N	028	E	011	NE	SENE	002-501-03		Well	203
		- 118.7296	41.4888	Humboldt	Nevada	502.4	041	N	028	E	011	NE	SENE	002-501-03		Well	204
		- 118.7296	41.4888	Humboldt	Nevada	502.4	041	N	028	E	011	NE	SENE	002-501-03		Well	205
		- 118.7321	41.4907	Humboldt	Nevada	502.6	041	N	028	E	011	NE	SENE	002-501-03		Well	206
		- 118.7321	41.4907	Humboldt	Nevada	502.6	041	N	028	E	011	NE	SENE	002-501-03		Stream	207
US BLM - Winnemucca Field Office - Realty	5100 East Winnemucca Boulevard, Winnemucca , NV 89445-2921	- 118.7446	41.4960	Humboldt	Nevada	503.4	041	N	028	E	002	SW	SWSW	889626		Well	208
		- 118.8318	41.5568	Humboldt	Nevada	510.0	042	N	027	E	013	SE	SESE	889636		Well	209
US BLM - Surprise Field Office - Realty	PO Box 460, Cedarville, CA 96104-0460	- 119.8466	41.5702	Washoe	Nevada	559.3	042	N	019	E	10	SW	SWSW	061-060-65		Well	210
		- 119.8466	41.5702	Washoe	Nevada	559.3	043	N	019	E	10	SW	SWSW	061-060-65		Well	211
		- 119.8466	41.5702	Washoe	Nevada	559.3	043	N	019	E	10	SW	SWSW	061-060-65		Well	212
Patrick D. Fitzgerald	3157 Wagoner Heights Road, Stockton, CA 95209-4867	- 119.8652	41.8102	Washoe	Nevada	574.4	045	N	019	E	021	NW	NENW	061-130-04		Spring	213
		- 119.8724	41.8268	Washoe	Nevada	575.6	045	N	019	E	017	NE	NENE	061-130-04		Well	214
US BLM - Surprise Field Office - Realty	PO Box 460, Cedarville, CA 96104-0460	- 119.9241	41.9121	Washoe	Nevada	582.1	046	N	018	E	013	NW	SWNW	061-171-16		Well	215
US BLM - Lakeview Oregon Office	1301 South G Street, Lakeview, OR 97630-1800	- 120.0832	42.0761	Lake	Oregon	597.0	040	S	022	E	025	NW	NWNW	15453	100	ST	216
		- 120.1274	42.1178	Lake	Oregon	600.8	040	S	022	E	009	NE	NENE	15453	100	SW	217
Robert Lee Nelson	38809 Griggs Dr, Lebanon OR 97355	- 120.3366	42.1198	Lake	Oregon	615.5	040	S	020	E	003	SE	SESE	18543	901	Well	218
No Data	No Data	- 120.3537	42.1022	Lake	Oregon	617.0	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	ST	219
		- 120.3537	42.1022	Lake	Oregon	617.0	040	S	020	E	No Data	No Data	No Data	No Data	No Data	SW	220
		- 120.4634	42.0564	Lake	Oregon	623.8	040	S	019	E	No Data	No Data	No Data	No Data	No Data	SW	221
Michael Mello	1088 Route 28, South	- 120.5423	42.0180	Lake	Oregon		041	S	018	E	013	NE	NWNE	15998		WE	9038

Table 1-1 List of Landowners with Potential Wells and Springs for Monitoring

Owner	Address	LONG	LAT	COUNTY	STATE	AS_MP	PLSS_T	PLSS_TWNDIR	PLSS_R	PLSS_RNGDIR	PLSS_S	PLSS_QS	PLSS_QQS	Tax_Map#	Taxlot #	WR_TYPE	PRIMARY_KEY
	Yarmouth, MA 02664	- 120.5423	42.0180	Lake	Oregon		041	S	018	E	013	NE	NWNE	15998		WE	9039
Ostrander Resources Company	P.O. Box 1340, Lakeview, OR 97630	- 120.3556	42.1990	Lake	Oregon		039	S	020	E	010	SW	NWSW	18422	101	WE	9032
SnoKap Farms	4421 Gordon St SE, Salem, OR 97317	- 120.1591	42.1386	Lake	Oregon		039	S	022	E	031	SE	SESE	15446		Seep/Spring	9033
		- 120.1600	42.1387	Lake	Oregon		039	S	022	E	031	SE	SESE	15446		Seep/Spring	9034
		- 120.1599	42.1387	Lake	Oregon		039	S	022	E	031	SE	SESE	15446		Seep/Spring	9035
USDA Forest Svc	1301 S G St, Lakeview, OR 97630	- 120.9018	42.0076	Klamath	Oregon	648.5	041	S	015	E	014	SE	SESE	R744038	R-4114-V0000- 00100	ST	222
US BLM- Klamath Falls	6600 Washburn Wy, Klamath Falls, OR 97603	- 120.9758	42.0097	Klamath	Oregon	652.4	041	S	015	E	017	SW	SWSW	0	R-4115-00000- 00100	ST	223
JWTR LLC	6400 Hwy 66, Klamath Falls, OR 97601	- 120.9950	41.9993	Klamath	Oregon	653.6	041	S	015	E	019	NW	L 2	R119525	R-4015-00000- 01700	SW	224
US BLM- Klamath Falls	6600 Washburn Wy, Klamath Falls, OR 97603	- 121.1843	42.0001	Klamath	Oregon	663.5	041	S	014	E	021	NW	SENW	0	R-4114-00000- 00100	ST	225
Diana & Edwin Stastny	32121 Hwy 50, Malin OR 97632	- 121.7698	42.2159	Klamath	Oregon	672.6	041	S	012	E	024	SE	L 3	R111747	R-4112-02400- 00900	SW	226
United States	No Data	- 121.2164	42.0838	Klamath	Oregon		040	S	014	E	019	SE	NESE	R743725	R-4014-00000- 00100	WE	9037
V H Ranch Properties LP	18419 W Langell Valley RD, Bonanza, OR 97623	- 121.2534	42.0636	Klamath	Oregon		040	S	013	E	035	NE	NENE	R630375	R-4013-00000- 09300	WE	9036



## **2.0 Sampling Strategy**

### **2.1 Methods of Sampling and Analysis**

Sampling methods will adhere to the prevailing U.S. Environmental Protection Agency (EPA) and state sampling, analytical, and data quality assurance, and quality control procedures. All samples will be collected and properly preserved so that they are delivered to a certified laboratory and tested within the holding times required by the EPA and applicable state groundwater quality standards.

#### **2.1.1 Groundwater Wells**

Upon well owner/landowner consent, groundwater samples will be collected and discharge will be measured from each well determined to be potentially susceptible, as described above. A variety of well types are anticipated (e.g., smaller diameter, lower-volume domestic wells and larger diameter, higher volume stockwater and irrigation wells). The following subsections describe the procedures for groundwater sample collection and discharge measurement for the smaller and larger diameter wells. A field sampling decision matrix is presented in Table 2-1.

**Table 2-1 Field Sampling Decision Matrix**

	<b>Smaller Diameter Wells (&lt;4" diameter inner well casing)</b>		<b>Larger Diameter Wells (&gt;4" diameter inner well casing)</b>	
	<b>With Pump</b>	<b>Without Pump</b>	<b>With Pump</b>	<b>Without Pump</b>
<b>Sampling Pump</b>	Use existing pump	Use standard sampling pump	Use existing pump	Use standard sampling pump
<b>Water Level</b>	Measure depth to water and total depth if well cap is removable	Measure depth to water and total depth if well cap is removable	Measure depth to water and total depth if well cap is removable	Measure depth to water and total depth if well cap is removable
<b>Purge</b>	<b>Active Well:</b> Ready to sample once field parameters stabilize	Purge 3 well volumes and sample once field parameters stabilize.	<b>Active Well:</b> Ready to sample once field parameters stabilize	Use low flow sampling methodology and sample once field parameters stabilize.
	<b>Inactive Well:</b> Purge 3 well volumes and sample once field parameters stabilize.		<b>Inactive Well:</b> Purge 3 well volumes and sample once field parameters stabilize.	
<b>Sample</b>	Sample before any treatment systems or holding tanks	Collect sample	Sample before any treatment systems or holding tanks	Collect sample
<b>Yield Test</b>	Run pump for up to 30 minutes; measuring flow rate and water level if possible; do not dry up well	Run pump for up to 30 minutes; measuring flow rate and water level if possible; do not dry up well	Examine well documentation for discharge rate	Examine well documentation for discharge rate

#### **2.1.1.1 Small-Diameter Groundwater Wells**

Groundwater shall be sampled from existing small-diameter wells using existing fitted pumps and discharge lines, where possible. In instances where dedicated pumps do not exist, sampling shall be conducted using a submersible pump. At the completion of groundwater sampling, all down-hole equipment shall be removed and decontaminated. When possible, sampling will occur directly from the pump outlet, before passage through holding tanks or water treatment systems such as water softeners or purifiers. Where access to the well or well head is blocked (e.g., the pump inside the well does not work; the well or well house is engulfed in vegetation, etc.), the field sampler shall coordinate with the well owner to access water from the nearest tap, preferably prior to any treatment.

Prior to sample collection, the well or water system shall be purged to help ensure that the water sample is representative of the aquifer. A minimum of three well volumes will be purged from each well to be sampled. In instances where the well to be sampled has been recently and consistently used (e.g., active domestic well), it will be assumed that three well volumes have already been purged. A water-quality meter (e.g. YSI 556 MPS or Horiba U-22) capable of measuring pH, conductivity, dissolved oxygen, turbidity and temperature shall be utilized to monitor water quality. A minimum of three sets of pH, conductivity, dissolved oxygen, turbidity, and temperature readings shall be taken at five-minute intervals. Once these measurements stabilize, water is considered to be flowing from the aquifer and is ready to sample.

During sampling E & E will use the Groundwater Sampling Data Sheet (Appendix A) to record sample collection and well inspection observations, purging parameters, and number of samples collected.

Discharge in gallons per minute will be determined at each well location either through the use of a flow meter or by using a container of known volume and a timer. The discharge will be calculated over a time period of up to 30 minutes. If possible, a water level meter will be used to monitor the water level until it reaches equilibrium with the pumps discharge rate. Discharge testing will stop if the well is at risk of being pumped dry. Although the discharge value is a measurement of well yield at the time of sampling, it should not be considered to be a maximum well yield and does not represent aquifer yield.

Following sample collection, the wells will be restored to the condition upon which they were found.

#### **2.1.1.2 Large Diameter Groundwater Wells**

Groundwater shall be sampled from large diameter wells using existing fitted pumps and discharge lines where possible. In instances where dedicated pumps do not exist, sampling

would be conducted using a submersible pump. At the completion of groundwater sampling, all down-hole equipment will be removed and decontaminated. When possible, sampling will occur directly from the pump outlet, before passage through holding tanks or into the irrigation system. Where access to the well or well head is blocked (e.g., the pump inside the well does not work; the well or well house is engulfed in vegetation, etc.), the field sampler shall coordinate with the well owner to access water from the nearest tap, preferably prior to any treatment.

Prior to sample collection, the well or water system shall be purged to help ensure that the water sample is representative of the aquifer. A water quality meter (e.g., YSI 556 MPS or Horiba U-22) capable of measuring pH, conductivity, dissolved oxygen, turbidity and temperature shall be utilized to monitor water quality. A minimum of three sets of pH, conductivity, dissolved oxygen, turbidity, and temperature readings shall be taken at five-minute intervals. Once these measurements stabilize, water is considered to be flowing from the aquifer and is ready to sample.

During sampling, E & E will use the Groundwater Sampling Data Sheet (Appendix A) to record sample collection and well inspection observations, purging parameters, and number of samples collected.

Well discharge in gallons per minute will be recorded on the Groundwater Sampling Data Sheet (Appendix A). It is anticipated that a well yield or maximum pumping rate will be available and discharge testing will not be necessary.

Following sample collection, the wells will be restored to the condition upon which they were found.

### **2.1.2 Springs**

Upon consent of the spring owner/landowner, water samples will be collected from springs determined to be potentially susceptible, as described above. Samples will be collected as close to the source as possible, and upstream of any holding tanks.

Discharge of springs will be calculated using one of the following methods:

1. A flow meter shall be employed to measure the velocity of the spring. The spring velocity will be multiplied by the cross sectional area of the spring to arrive at a discharge value in volume per time.
2. A timer will be used to measure the amount of time required to fill a calibrated five-gallon bucket.

During water sampling E & E will also record condition of the spring, date and time, location, weather (if outside), and number of samples taken.

Following sample collection, springs will be restored to the condition in which they were found, unless the owner requests otherwise (e.g., fill in hole where bucket or flow-meter was placed for measurement).

## **2.2 Sample Analysis**

All water samples collected from wells and springs will undergo analytical testing. Laboratory analysis will be conducted by a certified water testing laboratory. The following sections describe the analytical methods for both field and laboratory analyses.

### **2.2.1 Field Analysis**

Field analysis shall be accomplished using a field water quality meter such as the YSI 556 MPS or Horiba U-22 water quality meter. Parameters for field analysis shall include pH, conductivity, dissolved oxygen, turbidity, total dissolved solids, and temperature.

### **2.2.2 Laboratory Analysis**

Laboratory samples shall be collected in laboratory-supplied containers immediately following field analysis. Laboratory analysis will consist of TAL metals (EPA Method 6010); diesel and gasoline range total petroleum hydrocarbons (EPA Method 8015); oil and grease range total petroleum hydrocarbons (EPA Method 1664); volatile organic compounds (EPA Method 8260); and semi-volatile organic compounds (EPA Method 8270). Sample container requirements for each analysis are summarized in Table 2-2.

**Table 2-2 Sample Analysis Summary**

Matrix	Quantity <sup>a</sup>	Analytical Parameters/ Methods	Sample Preservation	Technical Holding Time <sup>b</sup>	Sample Container(s)
Water	100	TAL Metals/ EPA 6000/7000 Series or CLP SOW ILM05.4	Cool to 4°C ± 2°C, Nitric acid to pH ≤ 2	180 days from collection; mercury 28 days from analysis	One 1-Liter polyethylene bottle
	100	TPH as Diesel/EPA 8015	Cool to 4°C ± 2°C, Hydrochloric acid to pH ≤ 2	7 days from collection	Two 32-oz Amber glass jars
	100	TPH as Gasoline/EPA 8015	Cool to 4°C ± 2°C, Hydrochloric acid to pH ≤ 2	14 days from collection	Three 40-milliliter glass VOA vials
	100	TPH as Oil and Grease/EPA 1664	Cool to 4°C ± 2°C, Hydrochloric acid to pH ≤ 2	28 days from collection	Two 32-oz Amber glass jars
	100	VOCs/EPA 8260	Cool to 4°C ± 2°C, Hydrochloric acid to pH ≤ 2	14 days from collection	Three 40-milliliter glass VOA vials
	100	SVOCs/EPA 8270	Cool to 4°C ± 2°C	7 days to collection/ 40 days to analysis	Two 32-oz Amber glass jars

**Notes:**

<sup>a</sup> The number of samples presented is an estimate; the actual number of samples to be collected will be determined in the field.

<sup>b</sup> Technical holding times have been established only for water matrices. Water technical holding times were applied to sediment and soil samples; in some cases

recommended sediment/soil holding times are listed.

**Key:**

°C = Degrees Celsius; EPA = Environmental Protection Agency; ODEQ = Oregon Department of Environmental Quality; oz = ounce; TAL = Target Analyte List;

SVOCs = semi-volatile organic compounds; TPH = Total Petroleum Hydrocarbons; VOA = volatile organic analytes; VOCs = Volatile Organic Compounds

## **2.3 Sampling Schedule**

Wells and springs for which landowner approval has been received will undergo pre-construction baseline sampling. E & E will attempt to schedule sampling activities in May during a time convenient to the landowner and in a manner that does not damage the resource. In the event that a source cannot be tested within the required schedule, a contingency agreement with the landowner will be negotiated prior to construction in the vicinity of the well.

Water samples will be collected prior to construction to obtain baseline water quality and water system flow data for each sampling point. E & E will conduct post-construction sampling, within 30 days of the completion of construction in the area of each well, to assess if there are any effects of construction on the water source. Sampling methods, locations, and analytical parameters of the post-construction sampling will be consistent with that of the pre-construction sampling.









## **3.0 Investigation-Derived Waste**

Investigation-derived wastes generated during the course of the field activities are expected to be non-hazardous and managed according to the criteria established in the Management of Investigation-Derived Wastes During Site Inspections (EPA/540/G-91/009). It is expected that the investigation-derived wastes generated during site activities will be limited to decontamination water (from the decontamination of submersible pump), latex gloves, and other personal protective equipment. Solid waste will be rinsed before disposal and sent to a municipal sanitary landfill. The decontamination water will be returned to the ground so as not to migrate off site.



## 4.0 Quality Assurance Procedures

### 4.1 Quality Assurance/Quality Control Samples

Quality Assurance (QA) samples will be collected to help ensure that the project QA objectives are met. QA/Quality Control (QC) samples will include matrix spike/matrix spike duplicate samples and field duplicate samples. Table 4-1 presents a summary of the number and type of QA/QC samples to be collected.

One matrix spike/matrix spike duplicate sample will be submitted for all 20 samples submitted to the laboratory for analysis. Matrix spike samples reveal information about sample preparation and analytical methodology. They can provide information about sample homogeneity, extent of matrix bias, or interference with analyte recovery; they also can indicate the accuracy of the method.

One field duplicate sample will be submitted for every 10 samples submitted to the laboratory for analysis. The field duplicate samples will be submitted to the laboratory as blind duplicates, and will be labeled using a fictitious sample number.

One rinsate sample will be collected from the sampling pump for every 10 wells sampled. Rinsate samples are used to determine if the sampling pump was properly decontaminated and if cross contamination could have occurred between sampling locations.

**Table 4-1 QA/QC Analytical Summary and Fixed Laboratory Methods**

Laboratory	Matrix	Analytical Parameters/ Methods	Method Description/ Detection Limits	Total Field Samples <sup>a</sup> / Containers	QA/QC Sample Summary					Precision and Accuracy <sup>e</sup>
					Organic MS/MSD <sup>b</sup>	Inorganic MS/D <sup>b</sup>	Trip Blanks <sup>c</sup>	Rinsates	Analyses/ Containers <sup>d</sup>	
TBD	Water	TAL Metals/ EPA 6000/7000 Series or CLP SOW ILM05.4	ICP & AA / 0.2 µg/L	100/100	NA	5/5	NA	4/4	109/109	20% 75% - 125%
		TPH as Diesel/EPA 8015	GCS/FID / 0.25 mg/L	100/200	5/10	NA	NA	4/8	109/218	35% 60% - 140%
		TPH as Gasoline/EPA 8015	GCS/FID / 0.25 mg/L	100/200	5/10	NA	5/10	4/8	114/228	35% 60% - 140%
		TPH as Oil and Grease/EPA 1664		100/200	5/10	NA	NA	4/8	109/218	35% 60% - 140%
		VOCs/EPA 8260	GC/MS / 0.01µg/L	100/300	5/15	NA	5/15	4/12	114/342	20% 60% - 140%
		SVOCs/EPA 8270	GC/MS / 5µg/L	100/200	5/10	NA	NA	4/8	109/218	35% 60% - 140%

**Notes to  
Table 4-1:**

<sup>a</sup> Total number of field samples is estimated

<sup>b</sup> No extra volume is required for soil/sediment or products samples; for water samples, triple volume is required for organic analyses, and double volume is required for inorganic analysis. Sample numbers are based on MS/MSD per 20 samples per matrix.

<sup>c</sup> Rinsate blanks are not applicable for dedicated sampling equipment. The total number of trip blanks could vary depending on the total number of sample shipments. This number is based on the estimated number of days in the field. Note that trip blanks consist of water aliquots for both soil and water field samples.

<sup>d</sup> Total analyses and containers include both field and QA/QC aliquots to be submitted for fixed laboratory analysis. Note that trip blanks and rinsate blanks consist of water aliquots for both soil and water field samples.

<sup>e</sup> Advisory limits are shown. Laboratory- and method-specific QC limits will be used.

**Key:**

EPA = United States Environmental Protection Agency; FID = Flame ionization detector; GC = Gas chromatography; GCS = gas chromatographic separation; HRGC = High Resolution Gas Spectrometry; HRMS = High Resolution Mass Spectrometry; ICP = Inductively coupled argon plasma; mg/kg = milligrams per kilogram; mg/L = milligrams per liter; MS = Mass spectrometric detection; MS/D = Matrix spike/duplicate; MS/MSD = Matrix spike/matrix spike duplicate; NA = not applicable; ng/kg = nanograms per kilogram; ng/L = nanograms per liter; QA = quality assurance; QC = quality control; SVOCs = semivolatile organic compounds ; TAL = Target Analyte List; TBT = Tributyltin; TPH = total petroleum hydrocarbons; µg/L = micrograms per liter; VOCs = volatile organic compounds.

## **4.2 Sample Analytical and Handling Procedures**

This section describes procedures for sample identification and chain of custody that will be used for the field activities. The purpose of these procedures is to help ensure that the quality of samples is maintained during collection, transportation, storage, and analysis. All chain-of-custody requirements shall comply with E & E's SOPs for sample handling. Samples will be collected in the field following E & E SOPs and sent to the laboratories for analysis.

### **4.2.1 Sample Identification and Documentation**

Sample documentation for custody purposes includes:

- Sample identification numbers;
- Sample labels;
- Custody seals;
- Chain-of-custody records;
- Field logbooks; and
- Analytical records.

During the field effort, the field team leader or delegate is responsible for maintaining an inventory of these sample documents. This inventory will take the form of a cross-referenced matrix of the following:

- Sample location;
- Sample identification number;
- Analyses requested and request form number(s);
- Chain-of-custody record number; and
- Air bill numbers.

Brief descriptions of the major sample identification and documentation records and forms are provided below.

#### **4.2.1.1 Sample Identification**

Each sample will be assigned a unique number describing the sample location. The sample number will be recorded on a sample label, which will be affixed to the sample jar. Sample labeling for this investigation is summarized in Table 4-2.



**Table 4-2 Sample Coding**

Digits	Description	Code	Example
1,2	Matrix	GW	Groundwater
		RI	Rinsate
3,4,5	Team Number	000	500
6,7,8	Unique Number	000	250

#### 4.2.1.2 Sample Labels

Sample labels attached to or fixed around the sample container will be used to identify all samples collected in the field. The sample labels will be placed on bottles so as not to obscure any QA/QC lot numbers on the bottles, and sample information will be printed legibly. Field identification will be sufficient to enable cross-reference with the project logbook. For chain-of-custody purposes, all QA/QC samples will be subject to exactly the same custodial procedures and documentation as site samples.

To minimize handling of sample containers, labels will be filled out before sample collection. Each sample label will be written in waterproof ink, attached firmly to the sample containers, and protected with Mylar tape. The sample label will contain the following information:

- Sample number;
- Sample location number;
- Date and time of collection;
- Analysis required; and
- pH and preservation (when applicable).

#### 4.2.1.3 Custody Seals

Custody seals are preprinted, adhesive-back seals with security slots designed to break if the seals are disturbed. Sample shipping containers (e.g., coolers, drums, and cardboard boxes, as appropriate) will be sealed in as many places as necessary to promote data security. Seals will be signed and dated before use. Upon their arrival at the laboratory, the custodian will check (and certify by completing the package receipt log) that seals on shipping containers are intact.

#### 4.2.1.4 Chain-of-Custody Records

The chain-of-custody records will be completed fully at least in duplicate by the field technician designated by the site manager as responsible for sample shipment to the appropriate laboratory. Information specified on the chain-of-custody record will contain the same level of detail found in the site logbook, except that the on-site measurement data will

not be recorded. The custody record will include, among other things, the following information:

- Name and company or organization of person collecting the samples;
- Date of sample collected;
- Type of sampling conducted (composite/grab);
- Location of sample
- Number and type of containers shipped;
- Analysis requested; and
- Signature of the person relinquishing samples to the transporter, with the date and time of transfer noted, and signature of the designated sample custodian at the receiving facility.

If samples require rapid laboratory turnaround, the person completing the chain-of-custody record will note these or similar requirements in the remarks section of the custody record.

The relinquishing individual will record all shipping data (e.g., air-bill number, organization, time, and date) on the original custody record, which will be transported with the samples to the laboratory and retained in the laboratory's file. Original and duplicate custody records with the air bill or delivery note constitute a complete custody record. It is the site manager's responsibility to help ensure that all records are consistent and that they are made part of the permanent job file.

#### **4.2.1.5 Field Logbooks and Data Forms**

Field logbooks (or daily logs) and data forms are necessary to document daily activities and observations. Documentation will be sufficient to enable participants to reconstruct events that occurred during the project accurately and objectively at a later time. All daily logs will be kept in a bound notebook containing numbered pages, and all entries will be made in waterproof ink, dated, and signed. No pages will be removed for any reason.

If corrections are necessary, they will be made by drawing a single line through the original entry (so that the original entry is still legible) and writing the corrected entry alongside it. The correction will be initialed and dated. Corrected errors may require a footnote explaining the correction.

#### **4.2.1.6 Photographs**

Photographs will be taken of the well heads and springs to document their pre- and post-construction condition. Documentation of a photograph is crucial to verify that it represents an existing situation. The following information concerning photographs will be noted in the project or task logbook:

- Date, time, and location photograph was taken;
- Weather conditions;
- Description of photograph;
- Reasons photograph was taken;
- Sequential number of the photograph; and
- Direction.

After the photos are processed, the information recorded in the field logbook will be summarized in captions in the digital photo log.

#### **4.2.2 Custody Procedures**

The primary objective of chain-of-custody procedures is to provide an accurate written or computerized record that can be used to trace the possession and handling of a sample from collection to completion of all required analyses. A sample is considered to be in custody if it is:

- In someone's physical possession;
- In someone's view;
- Locked up; or
- Kept in a secured area that is restricted to authorized personnel.

##### **4.2.2.1 Field Custody Procedures**

The following guidance will be used to properly control samples during fieldwork:

- As few people as possible will handle samples;
- Coolers or boxes containing cleaned bottles will be sealed with a custody tape seal during transport to the field or while in storage before use. Sample bottles from unsealed coolers or boxes, or bottles that appear to have been tampered with, will not be used;
- The sample collector will be responsible for the care and custody of samples until they are transferred to another person or dispatched properly under chain-of-custody rules;
- The sample collector will record sample data in the field logbook; and
- The site team leader will determine whether proper custody procedures were followed during the fieldwork and decide whether additional samples are required.

When transferring custody (i.e., releasing samples to a shipping agent), the following will apply:

- The coolers in which the samples are packed will be sealed and accompanied by two chain-of-custody records. When transferring samples, the individuals relinquishing and receiving them must sign, date, and note the time on the chain-of-custody record. This record documents sample custody transfer;
- Samples will be dispatched to the laboratory for analysis with separate chain-of-custody records accompanying each shipment. Shipping containers will be sealed with custody seals for shipment to the laboratory. The method of shipment, name of courier, and other pertinent information will be entered in the chain-of-custody record;
- All shipments will be accompanied by chain-of-custody records identifying their contents. The original record will accompany the shipment. The other copies will be distributed appropriately to the site team leader and site manager; and
- If sent by common carrier, a bill of lading will be used. Freight bills and bills of lading will be retained as part of the permanent documentation.

#### **4.2.2.2 Laboratory Custody Procedures**

A designated sample custodian at the laboratory will accept custody of the shipped samples from the carrier and enter preliminary information about the package into a package or sample receipt log, including the initials of the person delivering the package and the status of the custody seals on the coolers (i.e., broken versus unbroken).

#### **4.2.3 Sample Handling, Packaging, and Shipping**

The transportation and handling of samples must be accomplished in a manner that protects their integrity, maintains the proper sample temperature, and maintains the sample's chain-of-custody.

##### **4.2.3.1 Sample Packaging**

Samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. The following sample package requirements will be followed:

- Sample bottle lids must never be mixed. All sample lids must stay with the original containers;
- The sample volume level can be marked by placing the edge of the label at the appropriate sample height or by using a grease pencil. This will assist the laboratory in determining whether any leakage occurred during shipment. The label should not cover any bottle preparation QA/QC lot numbers;
- All sample bottles will be placed in a plastic bag to minimize leakage in case a bottle breaks during shipment;
- The samples will be cooled by placing ice in sealed plastic bags. Ice is not to be used as a substitute for packing materials;

- Any remaining space in the sample shipping container should be filled with inert packing material. Under no circumstances should material such as sawdust, newspaper, or sand be used; and
- The custody record must be sealed in a plastic bag and placed in the shipping container. Custody seals must be affixed to the sample cooler.

#### **4.2.3.2 Shipping Containers**

The appropriate shipping container will be determined by U.S. Department of Transportation (DOT) or International Air Transport Association (IATA) regulations for the anticipated level of suspected contaminants.

Shipping containers are to be custody-sealed for shipment as appropriate. The custody seals will be affixed in such a way that access to the container can be gained only by breaking a seal.

Field personnel will make arrangements for transportation of samples to the laboratory. When custody is relinquished to a shipper, field personnel will telephone the laboratory sample custodian to inform him or her of the expected time of arrival of the sample shipment and to advise him or her of any time constraints on sample analysis.

#### **4.2.3.3 Marking and Labeling**

Suggested guidelines for marking and labeling shipping containers are presented below. In all cases, DOT or IATA regulations should be consulted for appropriate marking and labeling requirements, which include the following:

- Use abbreviations only where specified;
- The words “This End Up” or “This Side Up” must be printed clearly on the top of the outer package. Upward-pointing arrows should be placed on the sides of the package; and
- After a shipping container is sealed, two chain-of-custody seals will be placed on the container, one on the front and one on the back. If the shipping container is a drum, one seal will be placed on each side (opposite of each other) of the drum. To protect the seals from accidental damage, clear strapping tape will be placed over them.

### **4.3 Calibration Procedures and Frequency**

All instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturers’ guidelines and recommendations, as well as criteria set forth in the applicable analytical methodology references. Documentation of all routine and special maintenance and calibration

information will be maintained in an appropriate logbook or reference file, and will be available on request.

# **A. Groundwater Sampling Data Sheet**





# GROUNDWATER SAMPLING DATA SHEET

SITE NAME: Ruby Groundwater Monitoring WELL No.:                      DATE:                     

## 1. FIELD OBSERVATION AND MEASUREMENTS

- a. Field Personnel: \_\_\_\_\_
- b. Visitors at Site: \_\_\_\_\_
- c. Type of Well: \_\_\_\_\_

d. Well Measurements:

Depth to Water (DTW): \_\_\_\_\_

Measuring Point (circle):      Top of casing / Ground surface

Total Depth of Well (TD): \_\_\_\_\_

Diameter of Well (circle):      2-inch / 4-inch / 6-inch / 8-inch

Water Column (TD – DTW):

Calculated Required Purge Volume: \_\_\_\_\_

- e. Purging/Sampling Method (circle): Low Flow / 2" Grundfos / 12V KVA Pump / Bailer

## 2. PURGING PARAMETERS

[illegible]

Final										

3. **SAMPLE COLLECTION SUMMARY** Sample Time: \_\_\_\_\_

ANALYSES AND SAMPLE NUMBERS				
Sample	NWTPH-Gx	NWTPH-Dx	Total Metals	

VOLUME OF WATER IN CASING			
Casing Diameter (inches)	Gallons per foot of Depth	Cubic Feet per Foot of Depth	Liters per Meter of Depth
2	0.163	0.0218	2.024
4	0.653	0.0873	8.11
8	2.611	0.3491	32.43
12	5.81	0.7767	65.97

1 Cubic Foot = 7.48 gallons or 28.32 liters

1 Gallon = 3.785 liters or 0.1337 cubic feet

## GROUNDWATER MEASUREMENT DATA SHEET

SITE NAME: Ruby Groundwater Monitoring WELL No.: \_\_\_\_\_ DATE: \_\_\_\_\_

## 4. WELL INSPECTION

- a. Area Surrounding Well: \_\_\_\_\_
- b. Standing Water Present Around Well: Yes / No \_\_\_\_\_
- c. Insects or Rodents Seen at or in the Well Casing or Cap: Yes / No \_\_\_\_\_
- d. Evidence of Wood Destroying Insects Near Well: Yes / No \_\_\_\_\_
- e. Above Ground Storage Tanks Near Well: Yes / No \_\_\_\_\_
- f. Gas Station or Industries Near Well: Yes / No \_\_\_\_\_
- g. Visible Well Casing Condition: \_\_\_\_\_
- h. Well Cap Condition: \_\_\_\_\_
- i. Visible Pump Condition: \_\_\_\_\_
- j. Pressure/Storage Tank Condition: \_\_\_\_\_
- k. Pressure Switch Condition: \_\_\_\_\_
- l. Pressure Switch Setting (PSI): \_\_\_\_\_
- m. Visible Piping Condition: \_\_\_\_\_
- n. Flow Rate (GPM): \_\_\_\_\_
- o. Visible Wiring Condition: \_\_\_\_\_
- p. Drawdown (DTW): \_\_\_\_\_
- q. Visible Soil Staining/Contamination: \_\_\_\_\_

